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(57) Abstract

This invention relates to a composite floor covering having a lower cushioning layer, at least one dimensionally stabilizing intermediate layer, and an upper layer of a decorative fabric. At least the upper surface of the decorative fabric has a protective polymeric coating. The floor covering has a resiliency of no greater than about 55 % and a density of at least about 10 lbs/ft^3.

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TITLE

DECORATIVE COMPOSITE FLOOR COVERINGS

FIELD OF THE INVENTION

This invention relates to a composite floor covering having medium resilience and good cushioning properties. More particularly, this invention relates to a composite floor covering having a lower cushioning layer, at least one dimensionally stabilizing intermediate layer and an upper layer of a decorative fabric, wherein the decorative fabric has a protective polymeric coating.

BACKGROUND OF THE INVENTION

Decorative floor coverings such as carpets and vinyl flooring are well known. Carpets offer greater comfort than vinyl flooring due to their soft, cushioning feel and better warmth. However, vinyl floor coverings are easier to clean than carpets and are available in a wider variety of decorative designs. There would be great utility in having a single floor covering which combines the advantages of carpet and vinyl flooring.

U.S. Patent No. 4,018,957 discloses a soft floor covering made of a decorative fabric, the upper surface of which is treated with a transparent wear layer of polyurethane or polyvinyl chloride (PVC). The lower surface of the fabric is attached to a resilient backing layer of 50-250 mils in thickness, preferably of PVC. There is no stabilizing layer between the decorative fabric and the resilient backing.

U.S. Patent No. 2,688,578 discloses an elastic decorative fabric bonded to a resilient backing pad. The backing pad is preferably sponge rubber several times thicker than the fabric. The

elastic fabric is capable of being stretched to 115-150% of its unstretched length so that the yarns of the fabric are not subjected to excessive strain when a force is applied to the surface, e.g., when a table leg pushes the fabric into the backing pad. This floor covering lacks a sufficient means for making it dimensionally stable. Also, the upper surface of the decorative fabric lacks a polymeric coating for improved wear and resistance to staining and soiling.

U.K. Patent No. GB 1,194,027 discloses a dimensionally stabilized double jersey knitted fabric bonded to a resilient backing. The fabric is stabilized dimensionally by application of a stabilizing solution or resin to one surface of the fabric or by bonding the underside of the fabric to a scrim or stabilizing fabric prior to bonding the fabric to a resilient backing. The resilient backing is one of high compression modulus, i.e., not a cushion, so that the floor covering would not have the soft underfoot feel of a carpet.

U.K. Patent No. GB 1,128,801 discloses a floor covering having 4-12 oz/yd^2 fabric bonded to a flexible polyurethane backing having a thickness of at least 1/8 inch, preferably 1/4-5/16 inch, and having a density of 2-5 pounds per cubic foot. This floor covering lacks a means to make it dimensionally stable. Also, the upper surface of the decorative fabric lacks a polymeric coating for improved wear and resistance to staining and soiling.

U.K. Patent No. 1,080,046 discloses a composite floor covering made from a top layer of a knitted fabric and a bottom layer of a foamed PVC which contains an elastomer for added bulk and resiliency. This floor covering lacks a means to

make it dimensionally stable. Also, the upper surface of the decorative fabric lacks a polymeric coating for improved wear and resistance to staining and soiling.

French Patent No. 2,160,631 discloses a decorative composite material composed of a surface layer made from a stabilized knitted fabric, having a decorative design printed onto the visible surface, and a backing layer made from an elastic polymer material. The upper surface of the decorative fabric lacks a polymeric coating for improved wear and resistance to staining and soiling.

There exists a need for a soft, reinforced, decorative composite floor covering which has the good cushioning feel of a pile carpet when walked on, while maintaining the dimensional stability necessary to prevent permanent deformation to its surface due to such forces as chair legs, foot traffic and the like. Also the decorative fabric surface layer should be resistant to abrasion, staining, and soiling and be easy to clean. The present invention provides such a composite floor covering. This floor covering has medium resilience and good cushioning properties making it suitable for use in a variety of residential rooms such as kitchens, bath, utility, and family rooms.

SUMMARY OF THE INVENTION

This invention relates to a composite floor covering material comprising a decorative fabric layer, at least one stabilizing layer, and a cushioning layer. The decorative fabric has an upper and lower surface and at least the upper surface is coated with a protective polymeric coating. For some applications, the lower surface may be coated with the same or different protective

polymeric coating. The stabilizing layer has an upper and lower surface. The cushioning layer has a thickness of at least 0.1 inches. The lower surface of the decorative fabric layer and the upper surface of the stabilizing layer are attached to each other and the lower surface of the stabilizing layer is in contact with the cushioning layer.

The composite floor covering has a resiliency of no greater than about 55% and a density of at least about 10 lb/ft^3. Preferably, the puncture resistance of the composite floor covering is at least about 800 $in\text{-}lb/in^2$.

In one embodiment, the cushioning layer comprises yarn pile extending from a backing material, wherein the lower surface of the decorative fabric layer and the upper surface of the stabilizing layer are attached to each other and the lower surface of the stabilizing layer is attached to the backing of the pile of the cushioning layer.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a side-elevational view of a composite floor covering of this invention showing the different layers.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a composite floor covering material having low resilience and good cushioning properties. Referring to Figure 1, the composite floor covering is composed of an upper layer of a decorative fabric (1) having a protective polymeric coating, at least one intermediate stabilizing layer (3) for dimensional stability, and a lower cushioning layer (5) for cushioning and support.

By the term, "decorative fabric" as used herein, it is meant a planar textile structure composed of yarns, fibers, or filaments and having an upper surface (facing) and lower surface, wherein the facing of the fabric provides a decorative effect. At least the upper surface is coated with a protective polymeric coating and the lower surface may be coated with the same or different protective polymeric coating. The lower surface of the decorative fabric is attached to a stabilizing layer (as described further below). These fabrics, wherein the decorative effect is provided by the fabric itself, differ from fabrics having a printable or decorable polymeric coating on their surface which are described in U.S. Patent 3,620,890. In the present invention, colors and designs can be applied to the fabrics by conventional techniques such as by dyeing the yarns, fibers or filaments which compose the fabric or by dyeing or printing the fabric itself. For example, in solution-dyeing processes, pigments are added to the fiber-spinnable polymer melt or solution prior to extrusion of the melt or solution through a spinneret to form solution-dyed fibers. Alternatively, the fibers may be pre-dyed by such techniques as "stock-dyeing" (the dyeing of fibers in staple form). Alternatively, the yarn may be pre-dyed before it used to form a fabric. Yarn dyeing techniques include skein-dyeing and space-dyeing. Dyed yarns of different colors may be used to give the fabric multicolored patterns.

A second method for imparting color to fabrics is printing. In general, printing involves applying coloring agents onto the fabric which is then treated with heat or chemicals to fix the coloring agents. Printing techniques include, for example, pigment printing, roller printing, screen printing, and heat transfer printing.

Textile fabrics suitable for use in this invention include, for example, velours, felts, woven, non-woven, knitted, flocked, needle-punched, and fusion-bonded fabrics. The fabrics are composed of natural or synthetic fibers. Such fibers include, for example, wool, cotton, polyamides (such as nylon 6,6, nylon 6, and copolymers thereof), polyesters, polyolefins (such as polypropylene), acrylics, rayon, and blends thereof. The fabrics may be textured or non-textured. Synthetic fibers having a denier per filament (dpf) of about 1 to about 20 dpf, and even sub-denier fibers, may be used to construct the fabric. These synthetic fibers may be used to make yarns. Yarns composed of natural fibers such as cotton and wool may also be used.

Each of the above-described fabrics (velours, felts, woven, non-woven, knitted, flocked, needle-punched, and fusion-bonded) are well known in the art. Generally, woven fabrics refer to fabrics composed of two sets of yarns, warp and filling, that are formed by weaving which is the interlacing of these sets of yarns. The three basic weaves are plain, twill, and satin. In the plain weave, yarns running in one direction (filling) go under and over alternate single yarns running in the other direction (warp). Plain weave fabrics are strong and durable. In the twill weave, yarns running in the filling direction go over one or more warp yarns and under groups of other yarns. Twill weave fabrics are strong with good shape-holding ability. In the satin weave, the face of the fabric consists almost entirely of warp or filling floats produced in the repeat of a weave. The points of yarn intersection are distributed as evenly and widely separated as possible. Satin-weave fabrics have a smooth, lustrous appearance.

Generally, non-woven fabrics refer to an assembly of textile fibers held together by interlocking in a random web or mat, by fusing of the fibers, or by bonding with an adhesive. Spun-bonded fabrics, such as Tyvek® or Typar® which are available from the DuPont Company, are composed of randomly arranged, continuous filament fibers bonded at filament cross-over points. These fabrics are lightweight and have good tensile and tear strengths. Spun-laced fabrics, such as Sontara® which is available from the DuPont Company, are composed of of fibers entangled in a predetermined repeating pattern to form a strong, non-bonded structure.

Generally, knitted fabrics refer to fabrics which are constructed by interlocking a series of loops of one or more yarns. In warp knitting, the yarns generally run lengthwise in the fabric. In weft knitting, one continuous thread runs crosswise in the fabric making all of the loops in one course. Weft knitting includes circular knitting and flat knitting. In circular knitting, the fabric is produced on the knitting machine in the form of a tube, wherein the threads run continuously around the fabric. In flat knitting, the fabric is produced on the knitting machine in flat form, wherein the threads alternate back and forth across the fabric.

For purposes of this invention, the decorative fabric preferably has a weight of about 1 to about 20 ounces per square yard and a thickness of about 20 mils to about 200 mils. More preferably, the decorative fabric has a weight of about 5 to about 20 oz/yd^2 and a thickness of about 35 mils to about 135 mils. These fabrics are especially suitable for use as an upper layer in the

floor covering, because of their durability and aesthetically pleasing appearance.

The decorative fabric is coated with a transparent, protective polymeric coating to provide the floor covering with various properties. For example, the polymeric coating may comprise poly(vinyl chloride) resins, plastisols, polyurethane, and silicone compositions as described in U.S. Patents 4,018,957 and 3,620,890 to provide the fabric with abrasion resistance. Acrylic compositions may also be used. The term, "polymeric coating" as used herein is also meant to encompass polymeric films including, for example, nylon, polyester (such as Mylar® available from the DuPont Company), and mixed ionomer resin (such as Selar® available from the DuPont Company) films. Other possible polymeric coatings include "stain-resist agents" which are polymer compositions that provide resistance to staining by acid dyes. These stain-resist agents include, for example, sulfonated phenol- or naphthol-formaldehyde condensate products and hydrolyzed vinyl aromatic-maleic anhydride polymers as described in U.S. Patent 4,925,707, stain-resist compositions comprising mixtures of sulfonated phenol-formaldehyde condensate products with a hydrolyzed polymer of maleic anhydride and one or more ethylenically unsaturated aromatic monomers as described in U.S. Patent 4,883,839, and stain-resist compositions of a partially sulfonated novolak resin and polymethacrylic acid as described in U.S. Patent 4,822,373. In addition, "soil-resist" agents which are polymer compositions that provide resistance to soiling may be used. These soil-resist agents include, for example, fluorochemical compositions as described in U.S. Patent 4,643,930 "Water-repellent agents" such as the fluorochemical, silicone, and acrylic compositions described in U.S. Patent 4,348,785 may

also be used. It is also understood that mixtures and blends of the above-described polymer compositions may be used, and that the coatings may contain other additives such as antimicrobial agents, UV stabilizers, antioxidants, and fillers.

The lower surface of the decorative fabric may also be coated with a polymeric coating which does not necessarily have to be transparent. This polymeric coating may comprise the same or different compositions than the polymeric coating used for the upper surface. For instance, it may be desirable to use a polymeric coating comprising a water repellent agent as described in U.S. Patent 4,642,930 on the lower surface of the decorative fabric to render the decorative fabric impervious to liquid spills, while a poly(vinyl chloride) resin coating is used on the upper surface or vice versa.

The thickness of the polymeric coating is typically in the range of about 0.5 mils to about 40 mils depending on the type of polymeric coating used. The polymeric coating may be applied to the fabric by such known techniques as extrusion, spraying, dipping, knife coating, transfer coating, or by lamination. In some instances, the polymeric coating may be subsequently cured by thermal heating, UV light, or fusion. In some instances, it is desirable to have the polymeric coating calendered or embossed onto the upper surface of the decorative fabric for special decorative effects.

It is also recognized that it is not necessary to apply the polymeric coating directly onto the fabric. Rather, the polymeric coating may be applied to the fiber before the fiber is used to construct the fabric or after the composite floor covering is installed.

A critical component of the composite floor covering in this invention is a reinforcing or stabilizing layer which provides dimensional stability to the floor covering and which provides the composite floor covering with a puncture resistance of at least 800 in-lb/in^2. The stabilizing layer, itself, is characterized by having a puncture resistance of at least 200 in-lb/in^2. The stabilizing layer has an upper and lower surface. The upper surface is attached to the lower surface of the decorative fabric, while the lower surface is in contact and preferably attached to the cushioning layer as described further below. It is important that the floor covering have at least one stabilizing layer, and in some instances where additional stability is required, there should be multiple stabilizing layers. The stabilizing layer also promotes better adhesion between the first layer (decorative fabric) and the third layer (cushioning layer). The stabilizing layer also provides resistance against punctures to the decorative fabric and cushioning layer and tends to reduce the degree of indentation marks when furniture legs and the like are placed on the floor covering. Finally, the stabilizing layer can also provide resistance against wear when the floor covering is subjected to heavy foot traffic.

The stabilizing layer is typically a scrim or sheet material comprising a fibrous non-woven material or thermoplastic compound. The scrim may comprise an open network of intersecting strands such as, for example, fiberglass, polypropylene, cotton, jute, nylon, and polyester strands. Fiberglass strands are particularly effective, because of their good tensile strength and "moisture stability." By the term, "moisture stability", it is meant that the length of the strands are substantially unchanged due changes in the

temperature and humidity. For purposes of this invention, the thickness of the scrim should generally be in the range of about 3 to about 250 mils.

The scrim may be produced by such techniques as described in U.S. Patents 3,728,195, 4,030,168 and 4,762,744. Typically, the amount of strands running in the "machine direction" (length direction), i.e., the direction in which the scrim is being produced by the machine and the amount of strands running in the "cross direction" (width direction), i.e., the direction perpendicular to the direction in which the scrim is being produced by the machine are equal. The strands should also be equally spaced apart in the length direction and width direction.

Fibrous non-woven sheets are described above and include spun-bonded fabrics such as Tyvek® and spun-laced fabrics such as Sontara® available from the DuPont Company. Thermoplastic compounds can also be used to make sheet materials having good stabilizing properties.

In addition to scrims and sheet materials, other materials may be used as the stabilizing layer. For example, velours, felts, woven, knitted, flocked, needle-punched and fusion-bonded fabrics may be used along with poly(vinyl chloride) resins, foamed urethane, and composite structures such as PVC vinyl flooring. These materials may be used independently or in combination with each other. For instance, the stabilizing layer may comprise a non-woven sheet adhered to a scrim. It is also recognized that these materials may be used in combination with each other. The type of material used for the stabilizing layer will vary depending on the desired properties of the composite floor

covering. For instance, certain materials may be more effective in providing resistance against indentation marks from heavy furniture and appliances. Other materials may be more effective in providing puncture resistance.

The stabilizing layer is attached to the underside, i.e., lower surface, of the decorative fabric by a suitable adhesive means which may be permanent or releasable. Examples of such adhesives include the following. Suitable aqueous latex adhesives include, for example, styrene-butadiene copolymers, ethylene/vinyl acetate copolymers, polyacrylates and blends thereof. Non-aqueous latex adhesives may also be used. Suitable thermoplastic adhesives include, for example, polyvinyl chlorides, polyurethanes, polyolefins, ethylene/vinyl ester copolymers, ethylene/alkyl (meth) acrylate copolymers, and ethylene/olefin copolymers. Suitable hot-melt adhesives include, for example, adhesives comprising a thermoplastic resin, tackifying resins, waxes, and plasticizers as described in U.S. Patents 4,939,036 and 4,844,765. The stabilizing layer may be coated with the adhesive in any manner such as by spraying, dipping, or kiss-roll coatings. In other embodiments, the stabilizing layer may be attached to the underside of the decorative fabric by a pressure sensitive adhesive, mechanical means such as by a Velcro® hook and loop fastening system or by knitting the scrim to the decorative fabric, or by ultrasonic bonding.

Another key component of the composite floor covering in this invention is the cushioning layer which is in contact with the lower surface of the stabilizing layer. Preferably, the lower surface of the stabilizing layer is attached to the cushioning layer by such permanent or releasable adhesive means as described above, but this is not necessary. In

some instances, it may be desirable to have the stabilizing layer simply lay on the cushioning layer.

The cushioning layer may comprise any suitable material such as for example, foamed compositions of rubber, latex, hot-melt resins, urethane, poly(vinyl chloride) resins. These compositions may be combined with fabrics such as velours, felts, wovens, non-wovens, knitted, flocked, needle-punched, and fusion-bonded to provide a good cushioning layer. Carpets such as unitary carpets and particularly tufted carpets having a tufted primary backing laminated to a secondary backing may also be used. The thickness of the cushioning layer is at least 0.1 inches and is preferably in the range of about 0.125 inches to about 0.625 inches. Preferably, the density of the cushioning layer is greater than 3.0 lbs/ft^3. The thickness and density of the cushioning layer are significant, because these properties help provide the desired resilience and cushioning effect to the entire floor covering. Cushioning layers having certain physical properties are insufficient to provide the floor covering with the desired resiliency as shown in Comparative Example A below.

More particularly, the cushioning layer provides the composite floor covering of this invention with a resiliency of no greater than about 55% and a density of at least about 10 lbs/ft^3.

It may be desirable to vary the resiliency level and density of a composite floor covering, within the above-specified ranges, depending on the location where the floor covering is to be installed. For instance, if the floor covering is intended for use in a kitchen or utility room, it may have a low resiliency and high density to

provide firm support for heavy foot traffic and appliances. If the floor covering is intended for use in a formal living or family room, it may have a high resiliency and low density to provide a greater cushioning and more comfortable effect.

The cushioning layer may be a carpet comprising a primary backing laminated to secondary backing material with tufts of yarn projecting from the primary backing. The projecting tufts have tufts bases stitched into the primary backing and tuft tips extending therefrom. Such fibers include, for example, wool, polyamides (such as nylon 6,6 or nylon 6), polyesters, polyolefins (such as polypropylene), acrylics, rayon, and blends thereof. The primary backing may be a woven material of natural or synthetic materials such as jute, wool, rayon, polyamides, polyesters, and polyolefins. Nonwoven primary backings may also be used. The tufted primary backing is laminated to a secondary backing by a polymeric latex such as styrene-butadiene rubber (SBR), thermoplastic adhesive, or other suitable material. Examples of suitable secondary backings include jute, woven tapes of polypropylene, woven polypropylene fabrics, felts such as felts of shredded used carpet, and thermoplastic sheets. It is also recognized that discarded and recycled carpets could be used as the cushioning layer in the floor coverings of this invention.

If a carpet having a tufted primary and secondary backing is used as the cushioning layer, it is preferable that the secondary backing be attached to the lower surface of the stabilizing layer (e.g., a scrim or non-woven sheet) and that the projecting tufts be in contact with the floor. However, in some instances, it may be desirable to attach the projecting tufts from the primary backing

to the lower surface of the stabilizing layer. This may be done by spraying the tufts and decorative fabric with an adhesive.

In some instances, a carpet having a tufted primary backing laminated to a secondary backing or carpet tiles may be used as the stabilizing layer and cushioning layer. The secondary backing in tufted carpets is a particularly effective stabilizing layer, because it is typically a polypropylene scrim which is laminated to the tufted primary backing by latex and this scrim can be readily attached to the underside of the decorative fabric. The tufted primary backing is a particularly effective cushioning layer, because of the tufted yarns (pile). The pile height, density, and weight may be adjusted to give the desired cushioning effect. Further, such a floor covering may be reversed in order to use the tufted primary backing layer as the surface layer. This would be particularly desirable in instances where good quality, colored, tufted yarns are used in the primary backing.

The present invention is further illustrated by the following examples, but these examples should not be considered as limiting the scope of the invention. The following Test Methods were used to measure the properties described in these examples.

TEST METHODS

PUNCTURE RESISTANCE - This test measures the energy required to puncture a material. Results are expressed as puncture resistance per unit area of the measurement probe. Samples are first conditioned at 75+/- 2°F and at 55 +/- 2% relative humidity (RH) for at least 24 hours. The sample to be tested is then clamped taut in a frame mounted on an Elmendorff tear tester equipped with a Spencer

impact attachment (Thwing-Albert Instrument Co. Philadelphia, PA). A 3/16-in. (4.76 mm) Spencer probe having a 1/10-in. (2.54 mm) radius hemispherical tip is used. The puncture resistance reported is the average of 5 readings.

THICKNESS - A Randall Stickney gauge (Frank E. Randall Co., Inc., Waltham, MA) having a 3/8-in. diameter presser foot, which applies 3.4 psi pressure, is used to measure the thickness of a sample. Samples are first conditioned at 75+/- 2°F and at 65 +/- 2% relative humidity (RH) for at least 24 hours prior to testing. The presser foot is then lowered onto the sample and 5 seconds are allowed to elapse prior to recording the thickness reading. Thickness values reported are the averages of 5 readings.

RESILIENCY - A Compression Tester (Model KES-FB-3 from Kawabata Evaluations System (KES) Kato Tech. Co., Ltd.) is used to measure the resiliency of the floor covering in accordance with the instructions provided in the provided manual. Resiliency values reported are the averages of 5 readings.

EXAMPLES

Example 1:

A composite floor covering comprising a decorative fabric layer with a protective polymeric coating, a stabilizing layer, and a cushioning layer was prepared. The decorative fabric was a woven upholstery polyester/cotton blend fabric having a thickness of 2.491 mm and was padded with a 2.0% on weight of fabric (OWF) of Zonyl® 7040 fluorochemical solution which is available from DuPont. This surface-coated fabric was then dried at 360°F for 1 minute. The fabric was then backcoated with

approximately 3.5 oz/yd^3 of the following compound: 20% Rhoplex HA-8 and 10% Acrysol ASE-60, both available from Rohm and Haas, 2.5% Ammonia, 62.5% Water and 0.5% Zonyl® 7040. The backcoated fabric was then dried at 325°F for 1 minute. The treated fabric was then adhesively attached to the upper surface of the stabilizing layer with approximately 18 to 20 oz/yd^2 of a styrene-butadiene rubber (SBR) latex 9070. The stabilizing layer was composed of a woven polypropylene backing of 8 x 8 threads per inch, having a thickness of 1.274 mm and weighing about 3.4 oz/yd^3. A needlepunched fabric with a rubber backing and a thickness of 0.285 inches and a weight of 44.6 oz/yd^2 was used as the cushioning layer. The lower surface of the stabilizing layer was adhesively attached to the fabric side of the cushioning layer using the above-described SBR latex. The composite floor covering sample was allowed to dry at room temperature for 24 hours in order for the adhesives to dry. The resiliency and density of the floor covering are reported in Table 1. The puncture resistance of the floor covering was 1092 in-lb/in^3.

Example 2:

A composite floor covering comprising a decorative fabric layer with a protective polymeric coating, a stabilizing layer, and a cushioning layer was prepared as described above in Example 1, except a fusible web, weighing 2.8 oz/yd^2 and having a thickness of 0.23 mm was used as the stabilizing layer in place of the polypropylene backing and no latex adhesive was used. Rather, this web was heat-laminated and bonded to the lower surface of the decorative fabric and adhered to the upper surface of the cushioning layer using about 8 oz/yd^2 of a spray adhesive (Sparayway No. 55 available from Sprayway, Inc.). The resiliency and density of the floor covering are reported in Table 1. The

puncture resistance of the floor covering was 1104 in.lb/in^2.

Example 3:

A composite floor covering comprising a decorative fabric layer with a protective polymeric coating, a stabilizing layer, and a cushioning layer was prepared. A woven upholstery fabric as described in Example 1 was used as the decorative fabric. A dyed, loop pile carpet having a nylon yarn tufted, woven polypropylene primary backing laminated by styrene-butadiene rubber latex to a woven polypropylene secondary backing with a yarn pile height of 1/4 inches and a pile weight of 28 oz/yd^2 was attached to the decorative fabric in the following manner. The woven polypropylene secondary backing was used as the stabilizing layer, i.e., the lower surface of the decorative fabric was adhesively attached by SBR latex adhesive to the woven polypropylene secondary backing. The woven polypropylene primary backing with its tufted nylon yarn pile was used as the cushioning layer. This composite floor covering could be used as a reversible carpet. The resiliency and density of the floor covering are reported in Table 1. The puncture resistance of the floor covering was 1104 in-lb/in^2.

Example 4:

A composite floor covering comprising a decorative fabric layer with a protective polymeric coating, a stabilizing layer, and a cushioning layer was prepared as described above in Example 1, except a polyurethane rebond foam cushion having a thickness of 0.52 inches, a weight of 34.7 oz/yd^2 and a density of 5.5 lb/ft^3 was used as the cushioning layer. The resiliency and density of the floor covering are reported in Table 1. The

puncture resistance of the floor covering was 1092 in-lb/in^2.

Comparative Example A

A composite floor covering comprising a decorative fabric layer with a protective polymeric coating, a stabilizing layer, and a cushioning layer was prepared as described above in Example 1, except a polyurethane foam cushion having a thickness of 0.34 inches, a weight of 12.2 oz/yd^2 and a density of 3.0 lb/ft^3 was used as the cushioning layer. The resiliency and density of the floor covering are reported in Table 1. The puncture resistance of the floor covering was 1068 in-lb/in^2.

TABLE 1

Example	Weight (oz/yd^2)	Density (lbs/ft^3)	Thickness mm (inches)	** Work WC $g.cm/cm^2$	** Work WC' $g.cm/cm^2$	Resilience %
1	93.5	19.1	10.405 (0.41)	0.756	0.256	33.73
2	82.1	16.0	10.292 (0.41)	1.35	0.523	38.77
3	105.5	23.6	9.373 (0.37)	1.396	0.574	41.50
4	80.1	10.6	16.211 (0.64)	2.062	1.116	54.22
A*	50.9	10.4	10.46 (0.412)	5.30	3.52	66.18

* Comparative Example
** WC refers to the compression work and WC' refers to the recovery work as measured by the above-described KES Compression Tester.

CLAIMS:

1. A composite floor covering material, comprising:

a) a decorative fabric layer having an upper and lower surface, wherein at least the upper surface has a protective polymeric coating;

b) at least one stabilizing layer having an upper and lower surface; and

c) a cushioning layer having a thickness of at least 0.1 inches, wherein the lower surface of the decorative fabric layer and the upper surface of the stabilizing layer are attached to each other and the lower surface of the stabilizing layer is in contact with the cushioning layer, said floor covering having a resiliency of no greater than about 55% and a density of at least about 10 lb/ft^3.

2. The composite floor covering of claim 1, wherein the puncture resistance of the floor covering is at least about 800 $in\text{-}lb/in^2$.

3. The composite floor covering of claim 1, wherein the protective polymeric coating on the upper surface of the decorative fabric comprises a polymer selected from the group consisting of poly(vinyl chloride), plastisols, polyurethane, stain-resist agents, soil-resist agents, water-repellent agents, fluorochemicals, silicones, acrylics, and mixtures thereof.

4. The composite floor covering of claim 1, wherein the protective polymeric coating comprises a polymeric film.

5. The composite floor covering of claim 3 or 4, wherein the protective polymeric coating has been calendered or embossed on the upper surface of the decorative fabric.

6. The composite floor covering of claim 1, wherein the weight of the decorative fabric is about 1 to about 20 oz/yd^2 and the thickness of the decorative fabric is about 10 mils to about 200 mils.

7. The composite floor covering of claim 6, wherein the decorative fabric is selected from the group consisting of velour, felt, woven, non-woven, knitted, flocked, needle-punched, and fusion-bonded fabrics.

8. The composite floor covering of claim 6, wherein the fabric is dyed or printed.

9. The composite floor covering of claim 6, wherein the fabric comprises solution-dyed or pre-dyed fibers.

10. The floor covering of claim 6, wherein the fabric comprises fibers selected from the group consisting of wool, cotton, polyamide, polyester, polyolefin, acrylic, and rayon fibers.

11. The composite floor covering of claim 1, wherein the stabilizing layer comprises a scrim of intersecting strands selected from the group consisting of nylon, polypropylene, polyester, glass, and jute strands.

12. The composite floor covering of claim 1, wherein the stabilizing layer comprises a fibrous non-woven sheet.

13. The composite floor covering of claim 1, wherein the stabilizing layer comprises a fabric selected from the group consisting of velour, felt, woven, knitted, flocked, needle-punched, and fusion-bonded fabrics.

14. The composite floor covering of claim 1, wherein the cushioning layer comprises a foamed composition selected from the group consisting of rubber, latex, urethane, and poly(vinyl chloride).

15. The composite floor covering of claim 1, wherein the cushioning layer comprises a fabric selected from the group consisting of velour, felt, woven, non-woven, knitted, flocked, needle-punched, and fusion-bonded fabrics.

16. The composite floor covering of claim 1, wherein the cushioning layer comprises a carpet.

17. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by latex adhesives selected from the group consisting of styrene-butadiene rubber, styrene/acrylate copolymers, carboxylated vinylidiene chloride/butadiene copolymers, styrene/butadiene copolymers, ethylene/vinyl acetate copolymers, polyacrylates, and blends thereof.

18. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by thermoplastic adhesives selected from the group consisting of polyvinyl chlorides, polyurethanes, polyolefins, ethylene/vinyl ester copolymers, ethylene/alkyl (meth) acrylate copolymers, ethylene/olefin copolymers, and mixtures thereof.

19. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by a hot-melt adhesive comprising a thermoplastic resin.

20. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by a pressure sensitive adhesive.

21. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by mechanical means.

22. The composite floor covering of claim 1, wherein the decorative layer is attached to the stabilizing layer by ultrasonic bonding.

23. The composite floor covering of claim 1, wherein the upper and lower surface of the decorative fabric layer has a protective polymeric coating.

24. The composite floor covering of claim 23, wherein the upper and lower surface of the decorative fabric layer have different protective polymeric coatings.

25. The composite floor covering of claim 24, wherein the protective polymeric coating comprises a polymer selected from the group consisting of poly(vinyl chloride), plastisols, polyurethane, stain-resist agents, soil-resist agents, water-repellent agents, fluorochemicals, silicones, acrylics, and mixtures thereof.

26. A composite floor covering material, comprising:

a) a decorative fabric layer having an upper and lower surface, wherein at least the upper surface has a protective polymeric coating;

b) at least one stabilizing layer having an upper and lower surface; and

c) a cushioning layer having a thickness of at least 0.1 inches and comprising yarn pile extending from a backing material, wherein the lower

surface of the decorative fabric layer and the upper surface of the stabilizing layer are attached to each other and the lower surface of the stabilizing layer is attached to the backing of the pile of the cushioning layer, said floor covering having a resiliency of no greater than about 55% and a density of at least about 10 lbs/ft^3.

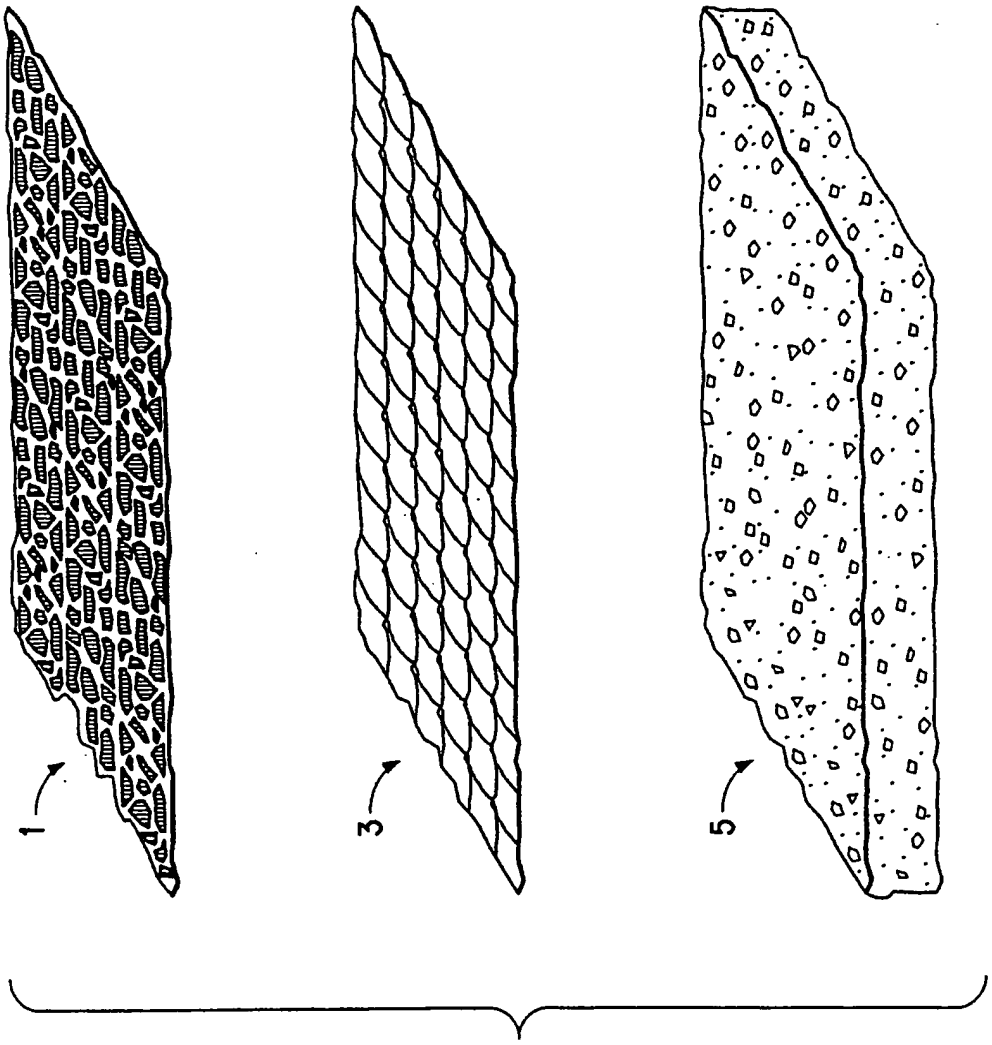

FIG. 1

INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/US 96/10622

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D06N7/00 B32B5/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D06N B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB,A,1 194 027 (MONSANTO TEXTILES LTD.) 10 June 1970 cited in the application see the whole document	1-15,17, 21
Y	US,A,4 018 957 (WERNER JESSE ET AL) 19 April 1977 cited in the application see column 2, line 67 - column 3, line 67; claims 1-7; figure 1 see column 6, line 9 - line 28	1-15,17, 21
A	FR,A,2 160 631 (LEVY ALBERT;FERBER WALTER) 29 June 1973 cited in the application see the whole document	1-15

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 October 1996	11. 11. 96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016	Pamies Olle, S

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INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/US 96/10622

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	BE,A,762 634 (FRUY FRANCOIS) 16 July 1971 see page 4, line 3 - last line; claims 1-4,9,12,13 ---	1
A	US,A,4 522 857 (HIGGINS KENNETH B) 11 June 1985 see the whole document -----	1

1

INTERNATIONAL SEARCH REPORT

...formation on patent family members

Intern... al Application No
PCT/US 96/10622

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
GB-A-1194027	10-06-70	NONE		
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		FR-A-	2354195	06-01-78
		NL-A-	7606396	16-12-77
FR-A-2160631	29-06-73	AU-A-	4864772	09-05-74
		BE-A-	791593	16-03-73
		CH-B-	559627	14-03-75
		CH-A-	1673672	30-09-74
		DE-A-	2255966	24-05-73
		JP-A-	48075867	12-10-73
		NL-A-	7215615	22-05-73
BE-A-762634	16-07-71	NONE		
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		AU-A-	4781585	10-04-86
		CA-A-	1237057	24-05-88
		EP-A-	0176346	02-04-86
		JP-C-	1721191	24-12-92
		JP-B-	3001966	11-01-91
		JP-A-	61179113	11-08-86

D06 M 15/41 B

2244 Research Disclosure
(1990)November, No.319, Emsworth, GB

D06 M 15/263

XP 000160169

31944
Stain-Resist Application Process p. 881

The use of stain-resist agents on polyamide textile substrates, particularly polyamide carpets, to prevent staining by foodstuffs containing acid dyestuffs is known in the art. It is known, as taught in U.S. Patent No. 3,790,344, that when polyamide substrates are aftertreated by immersion in a bath containing stain-resist agents such as sulfonated naphthol- or phenol-formaldehyde condensation products, dye-resist and washfastness performance is enhanced by including various electrolytes such as magnesium sulfate in the solution, presumably due to increased exhaust of the stain-resist agents onto the surface of the substrate.

US 3790344

One particular class of stain-resist compositions which comprise mixtures of sulfonated phenol-formaldehyde condensation products with a hydrolyzed polymer of maleic anhydride and one or more ethylenically unsaturated aromatic monomers is described in U.S. Patent No. 4,883,839. It has been found that polyamide substrates which have been treated with baths containing the stain-resist blends described in U.S. Patent No. 4,883,839 exhibit improved washfastness when treated in processes in which sodium sulfate has been added to the stain-resist bath. This is contrary to what is found for phenol-formaldehyde condensation products, which require divalent metal cations to achieve the desired improvement. The application of the stain-resist compositions containing sodium sulfate is particularly effective in continuous processes such as those using a "Fluidyer" apparatus or a "Flexnip" applicator. However, other processes, such as application in a beck apparatus, may be used.

US 4883.839

In a continuous process, a polyamide carpet is dyed by conventional means, such as a Kusters Fluidyer(R) on a continuous dye line. After dyeing, the carpet is rinsed and extracted. The carpet is then treated with a bath containing a stain resist agent comprising a mixture of a styrene/maleic anhydride copolymer and a sulfonated phenol-formaldehyde condensate on a Kusters Fluidyer(R). The bath is prepared by water dilution of the stain-resist composition to contain 0.1-2% on weight of fiber of the stain resist composition and 5-10 grams/liter of sodium sulfate. The bath is adjusted to pH 2.0-3.0 and applied to the carpet at about 40-160 degrees F and 300-400% on weight of fiber wet-pick-up, followed by steaming in a vertical steamer for a residence time of 0-9 minutes.

A carpet was dyed on a Kusters Fluidyer(R) on a continuous dye line. After dyeing, the carpet was rinsed and extracted. The carpet was then treated on a Kusters Fluidyer(R) with a bath containing 1.20% on weight of fiber of a stain-resist agent comprising 85% hydrolyzed styrene/maleic anhydride copolymer and 15% of a sulfonated phenol-formaldehyde condensation product. The bath also contained 0.15% on weight of fiber of Alkanol(R) ND and 5 g/liter of sodium sulfate. The bath was adjusted to pH 2.0 using sulfamic acid and was applied to the carpet at about 80 degrees F and 400% wet-pick-up on weight of fiber, followed by steaming in a vertical steamer for a residence time of 3 minutes. After the steamer, the carpet was rinsed and extracted. A commercially available latex composition was applied to the carpet which was then oven-cured.

The carpet was tested for stain resistance by immersing a 15 g carpet sample in 40 cc of a solution of staining agent prepared by mixing 45 grams of cherry-flavored, sugar-sweetened Kool-Aid(R) premix powder in 500 ml of water. The staining agent was worked into the carpet tufts and the sample left to stand undisturbed for 24 hours. The stained sample was rinsed with cool tap water, extracted to remove excess water, and dried. The staining was rated visually on a scale of 1-5 with 5=no staining, 4=slight staining, 3=moderate staining, 2=considerable staining, and 1=heavy staining. The treated carpet showed no stain (rating of 5) after the 24 hr. stain test. A sample of the carpet was tested for afterwash stain resistance by immersing a 15 g carpet sample in a room-temperature detergent solution containing 57 g of Duponol(R) WAQE in 3.8 liters of water. The pH of the solution was adjusted to 10 using 0.2% trisodium phosphate before introducing the carpet sample. The carpet was immersed in the detergent solution for 5 minutes, rinsed with cool tap water, extracted to remove excess liquid, and dried. The washed sample showed very slight staining (rating of 4.5) in the 24 hr stain test described above.

Another carpet sample was prepared in an identical manner, except that the sodium sulfate was eliminated from the stain-resist composition. The carpet was tested for stain resistance and showed no stain (rating of 5) after the 24 hr stain test without washing and showed slight staining (rating of 3.5) in the after-wash stain test.